Written Assignment 1

Introduction To Computer Systems (Carnegie Mellon University)

15-213: Introduction to Computer Systems
Written Assignment 1

This written homework covers the representation of information as bits, bit level manipulations, integer manipulations, representations of data in memory, pointers, and strings.

Directions

Complete the question(s) on the following pages with single paragraph answers. These questions are not meant to be particularly long! Once you are done, submit this assignment on Canvas.

Below is an example question and answer.

Q: Please describe the benefit of 2s-complement signed integers versus other approaches.

A: For other representations of signed integers (1s-complement and signed-magnitude), we end up representing both -0 and +0, which gets inconvenient when the computer wants to test for a zero result. Additionally, in both of these representations, implementing addition/subtraction is complicated. With 2s-complement, the hardware for addition / subtraction is the same for both signed and unsigned inputs.

Grading

Each assignment will be graded in two parts:

1. Does this work indicate any effort? (e.g. it's not copied from a homework for another class or from the book)
2. Three peers will provide short, constructive feedback.

Due Date

This assignment is due on Wednesday, September 16 by 11:59pm . Remember to convert this time to the timezone you currently reside in.

Question 1

Explain the process of casting a signed integer to an unsigned integer of the same width, and vice versa. How does the value change? Are there any edge cases?

Question 2

Explain the process of truncating an integer to a smaller bit size (keeping the sign). How does truncating affect the value when the integer is signed vs unsigned? Give the upper (positive) and lower (negative) boundaries for the values of a signed int such that when it is cast to a signed short, a sign change does not occur and give a brief justification.